

CLAIMS

What is claimed is:

1. A magnetic memory comprising:

a plurality of magnetic elements, each of the plurality of magnetic elements having a
5 top and a bottom;

at least a first write line connected to the bottom of each of a first portion of the
plurality of magnetic elements; and

at least a second write line residing above the top of a second portion of the plurality
of magnetic elements, the at least the second write line being electrically insulated from each
10 of the second portion of the plurality of magnetic elements.

2. The magnetic memory of claim 1 wherein each of the plurality of magnetic
elements is a magnetic tunneling junction including a pinned layer, a free layer and an
insulating layer between the pinned layer and the free layer.

3. The magnetic memory of claim 2 wherein the free layer resides below the
insulating layer.

4. The magnetic memory of claim 2 wherein the free layer resides above the
20 insulating layer.

5. The magnetic memory of claim 4 wherein the pinned layer is part of the at least the first write line.

6. The magnetic memory of claim 1 wherein the at least the second write line includes at least one magnetic write line.

7. The magnetic memory of claim 6 wherein the at least one magnetic write line further includes a laminated structure including at least one nonmagnetic layer and at least one soft magnetic layer.

8. The magnetic memory of claim 6 wherein the at least one magnetic write line includes at least one nonmagnetic line having at least one surface not facing the first portion of the plurality of magnetic elements, wherein the at least the first write line further includes at least one magnetic cladding layer, the magnetic cladding layer residing on the at least one surface.

9. The magnetic memory of claim 6 wherein the at least one magnetic write line includes a magnetic cladding layer, the magnetic cladding layer being electrically insulated from a remaining portion of the at least one magnetic write line by an insulator.

10. The magnetic memory of claim 1 wherein a material for the at least the first write line is provided and the at least the first write line is defined prior to the deposition of a second material for the plurality of magnetic elements.

5 11. The magnetic memory of claim 1 wherein a material for the at least the first write line is provided in a same deposition sequence as at least one layer of the plurality of magnetic elements.

10 12. The magnetic memory of claim 1 wherein the at least the first write line is defined after deposition of at least one layer of the plurality of magnetic elements.

13. The magnetic memory of claim 1 wherein the at least the first write line has a width in a first direction and wherein the plurality of magnetic elements has a dimension in the first direction and wherein the width and the dimension are both defined in a photolithography process.

14. The magnetic memory of claim 1 further comprising:
a plurality of isolation devices for the plurality of magnetic elements; and
a plurality of thin film conductors, the plurality of thin film conductors for
20 connecting the plurality of isolation devices with the top of each of the plurality of magnetic elements.

15. A method for providing magnetic memory comprising:

(a) providing a plurality of magnetic elements, each of the plurality of magnetic elements having a top and a bottom;

(b) providing at least a first write line connected to the bottom of each of a first portion of the plurality of magnetic elements; and

5 (c) providing at least a second write line residing above the top of a second portion of the plurality of magnetic elements, the at least the second write line being electrically insulated from each of the second portion of the plurality of magnetic elements.

10 16. The method of claim 15 wherein the magnetic element is a magnetic tunneling and wherein the magnetic element providing step (a) further includes the step of:

(a1) providing a pinned layer;

(a2) providing an insulating layer; and

(a3) providing a free layer, the insulating layer residing between the pinned layer and the free layer.

15 17. The method of claim 16 wherein the free layer providing step (a3) is performed prior to the insulating layer providing step (a2).

20 18. The method of claim 16 wherein the free layer providing step (a3) is performed after the insulating layer providing step (a2).

19. The method of claim 15 wherein the magnetic element is a magnetic tunneling junction including a pinned layer, a free layer, and an insulating layer between the pinned layer and the free layer and wherein the at least the first write line providing step (b) further includes the steps of:

5 (b1) providing the at least the first write line such that a plurality of portions of the at least the first write line functions as the pinned layer for each of the plurality of magnetic elements.

20. The method of claim 15 wherein the at least the second write line providing
10 step (c) further includes the step of:

(c1) providing at least one magnetic write line.

21. The method of claim 20 wherein the at least one magnetic write line further includes a laminated structure including at least one nonmagnetic layer and at least one soft
15 magnetic layer.

22. The method of claim 20 wherein the at least one magnetic write line includes at least one nonmagnetic line having at least one surface not facing the first portion of the plurality of magnetic elements, wherein the at least the first write line further includes at
20 least one magnetic cladding layer, the magnetic cladding layer residing on the at least one surface.

23. The method of claim 20 wherein the at least one magnetic write line includes a magnetic cladding layer, the magnetic cladding layer being electrically insulated from a remaining portion of the at least one magnetic write line by an insulator.

5 24. The method of claim 15 wherein a material for the at least the first write line is provided and the at least the first write line is defined in step (b) prior to the deposition of the plurality of magnetic elements in step (a).

10 25. The method of claim 15 wherein a material for the at least the first write line is provided in a same deposition sequence as at least one layer of the plurality of magnetic elements.

15 26. The method of claim 15 wherein the at least the first write line is defined after deposition of at least one layer of the plurality of magnetic elements.

27. The method of claim 15 wherein the at least the first write line has a width in a first direction and wherein the magnetic element has a dimension in the first direction and wherein the width and the dimension are both defined in a photolithography process.

20 28. The method of claim 15 further comprising:
(d) providing a plurality of isolation devices for the plurality of magnetic elements; and

(e) providing a plurality of thin film conductors, the plurality of thin film conductors for connecting the plurality of isolation devices with the top of the plurality of magnetic elements.